

## CLAIMS

### What is claimed is:

1. An impeller for a centrifugal pump, comprising at least one vane extending radially in length from a central axis of the impeller to an outer peripheral edge of said impeller, said at least one vane having an outer terminal end at or near said peripheral edge of said impeller, said outer terminal end having an outwardly extending portion being convex-like in shape.
2. The impeller of claim 1 further comprising at least one shroud having a peripheral edge defining said peripheral edge of said impeller, said at least one vane extending outwardly from said shroud.
3. The impeller of claim 2 wherein said outwardly extending portion has a terminus and a radius  $R_v$  measured from said central axis of said impeller to said terminus, and wherein said shroud has a radius  $R_s$ , measured from said central axis to said peripheral edge, wherein  $R_v$  is equal to or greater than  $R_s$ .
4. The impeller of claim 3 wherein said outer terminal end of said at least one vane further comprises a portion having a radius  $R_b$ , where  $R_b$  is less than or equal to  $R_s$ .
5. The impeller of claim 4 wherein said outwardly extending portion is arcuate

in shape.

6. The impeller of claim 4 wherein said outwardly extending portion has an outer edge which is formed by the intersection of at least two lines.

7. The impeller of claim 4 wherein said at least one vane has a width  $W_v$  and wherein said outwardly extending portion has a width  $W_p$ , where  $W_p$  is less than or equal to  $W_v$ .

8. The impeller of claim 7 wherein the area of said outwardly extending portion is from about 30% to about 85% the area defined by  $W_v(R_v - R_b)$ .

9. The impeller of claim 1 wherein said outwardly extending portion has an outer edge that is curved or arcuate.

10. The impeller of claim 1 wherein said outwardly extending portion has an outer edge formed by the intersection of at least two lines.

11. An impeller for a rotodynamic pump, comprising:  
a shroud having a central axis and a peripheral edge radially spaced from said central axis, said shroud having a radius  $R_s$ ;  
at least one vane extending axially outwardly from said shroud and extending radially

from at or near said central axis to said peripheral edge, said vane having an outer terminal end positioned at or near said peripheral edge, wherein said outer terminal end comprises an outwardly extending portion having a radius  $R_v$  measured from said central axis to a terminus of said outwardly extending portion; and

wherein  $R_v$  is equal to or greater than  $R_s$ .

12. The impeller of claim 11 further comprising a second shroud positioned parallel to and spaced from said shroud and wherein said at least one vane extends between said spaced apart shrouds.

13. The impeller of claim 11 wherein said outer terminal end of said at least one vane further comprises a portion having a radius  $R_b$ , wherein  $R_b$  is equal to  $R_s$ .

14. The impeller of claim 11 wherein said outer terminal end of said at least one vane further comprises a portion having a radius  $R_b$ , wherein  $R_b$  is less than  $R_s$ .

15. The impeller of claim 11 wherein said outwardly extending portion is convex-like in shape.

16. The impeller of claim 11 wherein said outwardly extending portion has an outer edge which is curved.

17. The impeller of claim 11 wherein said outwardly extending portion has an outer edge comprised of at least two intersecting lines.

18. The impeller of claim 11 wherein said at least one vane has a width  $W_v$ , and wherein the shape of said outwardly extending portion is from about 30% to about 85% of the area defined by  $W_v(R_v - R_s)$ .

19. The impeller of claim 13 wherein said at least one vane has a width  $W_v$ , and wherein the shape of said outwardly extending portion is from about 30% to about 85% the area defined by  $W_v(R_v - R_b)$ .

20. The impeller of claim 19 wherein said outwardly extending portion has an outer edge which is shaped to produce a flow velocity profile selected to reduce wear in a pump casing.

21. The impeller of claim 2 wherein said at least one shroud has a radius  $R_s$  measured from said central axis to said peripheral edge, and wherein said outwardly extending portion has a terminus and a radius  $R_v$  measured from said central axis of said impeller to said terminus and said outwardly extending portion has axial ends defining a radius  $R_b$  measured from said at least one axial end to said central axis, wherein  $R_b$  is less than  $R_v$  and  $R_s$ , and  $R_v$  is less than  $R_s$ .